

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA11 | Stoke Mandeville and Aylesbury

**Data appendix (AQ-001-011)**

Air quality

November 2013

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Department  
for Transport

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# 1 Introduction

1.1.1 The air quality appendix for the Stoke Mandeville and Aylesbury community forum area (CFA11) comprises:

- discussion of the policy framework (Section 2);
- baseline air quality data (Section 3);
- dust impact evaluation and risk rating (Section 4); and
- air quality assessment - road traffic (Section 5).

1.1.2 Maps referred to throughout the air quality appendix are contained in the Volume 5, Air Quality Map Book.

## 2 Policy framework

- 2.1.1 The Aylesbury Vale District Local Plan<sup>1</sup> does not contain any policies that are specific to air quality but contains some overarching policies for protection of public amenity. Saved Policy GB.8 seeks to prevent development that will unreasonably harm any aspect of the amenity of nearby residents whilst Saved Policy GP.95 seeks to protect the amenity of existing occupiers. Saved Policy G14 of the Wycombe Local Plan<sup>2</sup> seeks to prevent development which will result in a deterioration of local air quality particularly in Air Quality Management Areas (AQMAs). Policy CS18 of the Wycombe Core Strategy<sup>3</sup> seeks to reduce air pollution.
- 2.1.2 The Wycombe Delivery and Site Allocations Plan<sup>4</sup> (DSA) was submitted to the Planning Inspectorate in September 2012, but has yet to be adopted. Policy DM1 of the DSA seeks reduced travel via private car which will contribute to a higher standard of air quality.

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<sup>1</sup> Aylesbury Vale District Council (2004) *Aylesbury Vale District Local Plan 2004*.

<sup>2</sup> Wycombe District (2004) *Wycombe District Local Plan 2011 As Saved and Extended September 2007*; and replaced by the *Adopted Core Strategy July 2008 and Delivery and Site Allocations plan July 2013*

<sup>3</sup> Wycombe District Council (2008) *Wycombe Development Strategy Adopted Core Strategy Development Plan Document 2008*

<sup>4</sup> Wycombe District Council (2012) *Wycombe Delivery and Site Allocations Plan*

## 3 Baseline air quality data

### 3.1 Existing air quality

#### Local authority review and assessment information

- 3.1.1 Aylesbury Vale District Council carries out monitoring across its district. As part of its review and assessment process, the Council identified a number of areas where air quality may not be compliant with standards. The Council has declared AQMA's along the A41, Tring Road, Stoke Road and Friarage Road, for exceedances of the annual mean nitrogen dioxide (NO<sub>2</sub>) standard.
- 3.1.2 In its 2010 progress report the Council identified two further areas in Aylesbury and Buckingham Town Centre where concentrations of NO<sub>2</sub> were close to or exceeding air quality standards<sup>5</sup>.
- 3.1.3 The town of Buckingham lies more than 18km from the route of the Proposed Scheme within the study area and it is anticipated that construction traffic will not affect air quality in the town. The route of the Proposed Scheme does, however, pass close to the town of Aylesbury and the Friarage Road AQMA lies less than 2km from the route along the A418. Particular attention has been paid to the road traffic effects of the scheme at this location as construction traffic passes through Aylesbury itself and through the Friarage AQMA.

#### Local air quality monitoring data

- 3.1.4 Monitoring sites within the study area that are considered relevant for this assessment are shown in Map AQ-01-011 (Volume 5, Air Quality Map Book). The following sections provide a summary of the recorded pollutant concentrations at these sites.
- 3.1.5 The pollutant concentrations can be compared to the air quality standards:
- 40µg/m<sup>3</sup> as an annual mean for NO<sub>2</sub> and PM<sub>10</sub>;
  - 200µg/m<sup>3</sup> one-hour mean for NO<sub>2</sub> not to be exceeded more than 18 times a year (equivalent to the 99.8<sup>th</sup> percentile of the one-hour mean);
  - 50µg/m<sup>3</sup> 24-hour mean for PM<sub>10</sub> not to be exceeded more than 35 times a year (equivalent to the 90.4<sup>th</sup> percentile of the 24-hour mean); and
  - 25µg/m<sup>3</sup> as an annual mean for PM<sub>2.5</sub>.

#### Continuous monitoring

- 3.1.6 This section summarises the results from the continuous monitoring sites that are considered relevant for the assessment of air quality in this study area.

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<sup>5</sup> Aylesbury District Council (2010) *Air Quality Progress Report 2010*



Table 1: Annual mean pollutant concentrations recorded at continuous monitoring sites<sup>6,7</sup>

Pollutant	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ )				
	2008	2009	2010	2011	2012
<b>Bicester Road (480416, 214673)<sup>8</sup></b>					
NO <sub>2</sub>	54	44	N/A	N/A	N/A
<b>Friarage Road (481543, 213801)<sup>9</sup></b>					
NO <sub>2</sub>	N/A	N/A	41	36	N/A

Table 2: Number of hours when hourly mean NO<sub>2</sub> concentrations exceed  $200\mu\text{g}/\text{m}^3$  at continuous monitoring sites<sup>10,11,12</sup>

Site	Number of exceedances of hourly mean NO <sub>2</sub> standard				
	2008	2009	2010	2011	2012
Bicester Road <sup>8</sup>	4	3	N/A	N/A	N/A
Friarage Road <sup>9</sup>	N/A	N/A	0	0	N/A

### Diffusion tubes

3.1.7 This section summarises the results from the diffusion tube sites that are considered relevant for the assessment of air quality in this study area<sup>13</sup>.

Table 3: Annual mean NO<sub>2</sub> concentrations recorded at diffusion tube monitoring sites

Site	Ordnance Survey coordinates	Annual mean NO <sub>2</sub> concentrations ( $\mu\text{g}/\text{m}^3$ )				
		2008	2009	2010	2011	2012 <sup>14</sup>
Corner Friarage/Oxford Road	481456, 213857	44	45	49	39	N/A
89 Friarage Road	481509, 213839	41	46	54	43	N/A
Bicester Road West	480715, 214576	45	50	49	37	N/A
Bicester Road East	481525, 214292	35	38	38	30	N/A
Elmhurst Road <sup>15</sup>	482047, 214965	36	39	37	N/A	N/A

<sup>6</sup> Aylesbury District Council (2011) *Air Quality Progress Report 2011*

<sup>7</sup> Aylesbury District Council (2012) *Air Quality Updating and Screening Assessment 2012*

<sup>8</sup> Monitoring at this site stopped in 2009

<sup>9</sup> Monitoring at this site commenced in 2010. Data not available in 2012 local authority report

<sup>10</sup> Aylesbury District Council (2011) *Air Quality Progress Report 2011*.

<sup>11</sup> Aylesbury District Council (2012) *Air Quality Updating and Screening Assessment 2012*.

<sup>12</sup> 99.8<sup>th</sup> percentile of hourly mean concentrations not available in report documents

<sup>13</sup> Aylesbury District Council; Aylesbury Vale 6 year diffusion tube data; <https://www.aylesburyvaldc.gov.uk/environment/air-quality/monitoring>; Accessed: July 2013.

<sup>14</sup> Data not available in 2012 local authority reports

<sup>15</sup> Monitoring ceased 2010

Site	Ordnance Survey coordinates	Annual mean NO <sub>2</sub> concentrations (µg/m <sup>3</sup> )				
		2008	2009	2010	2011	2012 <sup>14</sup>
Long Meadow	483744, 212691	22	23	22	17	N/A
Croft Street <sup>16</sup>	482352, 213364	30	33	N/A	N/A	N/A

## Background pollutant concentrations

- 3.1.8 Estimates of background air quality have been taken from Department for Environment, Food and Rural Affairs (Defra) maps. Background NO<sub>2</sub> concentrations are within air quality standards throughout the study area, with annual mean concentrations in the range 16.4µg/m<sup>3</sup> - 22µg/m<sup>3</sup> in 2012. Background PM<sub>10</sub> concentrations are within air quality standards throughout the study area, with annual mean concentrations in the range 15.8µg/m<sup>3</sup> - 19.2µg/m<sup>3</sup> in 2012.

## Local emission sources

- 3.1.9 The main source of pollution in the study area is road vehicles. Major roads include the A41, A410, A418 and the B4443.

## 3.2 Receptors

### Human

#### *Construction phase*

- 3.2.1 Potential receptors are primarily those residential properties close to construction activity and alongside roads where traffic flows will change as a consequence of construction activity. Notable receptors close to construction activity are properties at Old Risborough Road, Whitethorn Farmhouse, Park Villa, Putlowes, Fleet Marston Cottages, Long Acre and properties on Meadoway. Receptors found to be close to roads where traffic flows will change are Gaydon (on the A4010 Risborough Road), Park Lodge and 78 Oxford Road (the A418) and along the A41 Bicester Road/Gatehouse Road in Aylesbury, including properties on Monmouth Close and Billingsfield Cottages. Receptors at greatest risk of dust effects are indicated in Map AQ-02-011-01 and Map AQ-02-011-02 (Volume 5, Air Quality Map Book).

#### *Operational phase*

- 3.2.2 Once operational, only receptors located on roads where there will be possible increases in operational traffic or where road alignments change have the potential to be affected. Receptors found to meet these criteria include The Oaks, Hatters End and Hall End.

<sup>16</sup> Monitoring ceased 2010

## **Ecological**

### *Construction phase*

- 3.2.3 The Chilterns Beechwoods Special Area of Conservation (SAC) has been considered in relation to construction traffic. Further details on this site can be found in (Volume 5, Appendix EC-011-252).

### *Operational phase*

- 3.2.4 No ecological receptors in the study area are predicted to be affected by air quality as a result of the operational phase.

## 4 Dust impact evaluation and risk rating

- 4.1.1 The following sections provide details of the assessment of construction impacts following the Institute of Air Quality Management (IAQM) guidance<sup>17</sup>. Where considered useful to identify receptors and their relationship to the construction activity, a specific figure is provided. On-site haul movements were assessed explicitly.
- 4.1.2 The dust assessment criteria for the haul route are based on those for earthworks, as set out in the IAQM guidance. This emission phase was considered to be the most applicable, as the assessment of impacts from earthworks will depend, in part, on the passage of vehicles over open surfaces. It was assumed that significant effects would not occur beyond a distance of 50m from the haul route, again based on interpretation of the earthworks criteria, and that all areas of the haul route will be subject to more than 10 vehicle movements per day. On the basis of criteria for earthworks within the IAQM guidance, the dust emission class for the haul route is large. Wherever there are receptors within 50m of a haul route, the sensitivity of the receiving environment was derived using the IAQM guidance. The need for, and capability of, the local environmental management plan (LEMP) to control these dust emissions, as directed by the draft Code of Construction Practice<sup>18</sup> (CoCP), was then considered in forming the conclusion of the assessment.

Table 4: Evaluation and risk rating of construction activities

Activity	Distance to nearest receptor	Dust emission class	Dust risk category	Sensitivity of surrounding area	Magnitude of impact (with draft CoCP mitigation measures)	Principal justifications
<b>Cuttings and embankments - Whitethorn Farm, Old Risborough Road, Park Villa, Putlowes, Fleet Marston Cottages and Meadoway (Map AQ-02-011-01, Figures 11.2 and 11.4, Map AQ-02-011-02, Figures 11.5 and 11.6 (Volume 5, Air Quality Map Book))</b>						
Demolition	Less than 20m	Medium	High	Medium	Negligible	1. Potentially dusty construction material. 2. Fewer than 10 receptors within 20m of the site.
Earthworks	Less than 20m	Large	High	Medium	Negligible	1. Total site area greater than 10,000m <sup>2</sup> 2. Fewer than 10

<sup>17</sup> Institute of Air Quality Management (IAQM), (2011), *Guidance on the assessment of the impacts of construction on air quality and the determination of their significance*

<sup>18</sup> Volume 5: Appendix CT-003-000

Activity	Distance to nearest receptor	Dust emission class	Dust risk category	Sensitivity of surrounding area	Magnitude of impact (with draft CoCP mitigation measures)	Principal justifications
						receptors within 20m of the site.
Construction	Less than 20m	Large	High	Medium	Negligible	1. Use of dusty construction materials. 2. Fewer than 10 receptors within 20m of the site.
Trackout	Less than 20m	Medium	Medium	Medium	Negligible	1. Fewer than 100 heavy goods vehicle (HGV) trips in any one day. 2. Fewer than 10 receptors within 20m of roadside.
Haul route	Less than 50m	Large	High	Medium	Negligible	1. More than 10 HGV movements per day. 2. Fewer than 10 receptors within 50m of haul route.
<b>The Thame Valley Viaduct - Putlowes (Map AQ-02-011-02, Figure 11.5 (Volume 5, Air Quality Map Book))</b>						
Demolition	N/A	N/A	N/A	N/A	N/A	No demolitions are required for the establishment of the viaduct.
Earthworks	200-350m	Large	Low	Low	Negligible	1. Total site area greater than 10,000m <sup>2</sup> 2. No receptors within 20m.
Construction	200-350m	Large	Low	Low	Negligible	1. Use of dusty construction materials. 2. No receptors within

Activity	Distance to nearest receptor	Dust emission class	Dust risk category	Sensitivity of surrounding area	Magnitude of impact (with draft CoCP mitigation measures)	Principal justifications
						20m.
Trackout	N/A	N/A	N/A	N/A	N/A	1. No receptors within 100m of trackout.
Haul route	N/A	N/A	N/A	N/A	N/A	1. No receptors within 50m of the haul route.
<b>The Stoke Mandeville bypass - Long Acre (Map AQ-02-011-02, Figure 11.1 (Volume 5, Air Quality Map Book))</b>						
Demolition	20-100m	Medium	Medium	Low	Negligible	1. Potentially dusty construction material. 2. No receptors within 20m.
Earthworks	20-50m	Large	High	Low	Negligible	1. Total site area greater than 10,000m <sup>2</sup> 2. No receptors within 20m.
Construction	20-50m	Large	High	Low	Negligible	1. Use of dusty construction materials. 2. No receptors within 20m.
Trackout	Less than 20m	Large	Medium	High	Negligible	1. More than 100 HGV trips in any one day. 2. 10 - 100 receptors within 20m of roadside.
Haul route	Less than 50m	Large	High	Medium	Negligible	1. More than 10 HGV movements per day. 2. Fewer than 10 receptors within 50m of haul route.

Table 5: Summary of construction dust impacts and effects

Location	Magnitude of impact	Effect of dust-generating activities	Additional mitigation
Series of cuttings and embankments	Negligible	Not significant	None required
The Thame Valley Viaduct	Negligible	Not significant	None required
The Stoke Mandeville bypass	Negligible	Not significant	None required

## 5 Air quality assessment - road traffic

### 5.1 Overall assessment approach

- 5.1.1 The air quality assessment for road-related emissions has considered the use of three different approaches based on the scale of changes in traffic and road alignment. Where the Design Manual for Roads and Bridges<sup>19</sup> (DMRB) thresholds detailed in the Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1) are not exceeded, no additional assessment is required as the air quality impacts will be minimal. If these thresholds are breached, then a quantitative assessment has been carried out.
- 5.1.2 Where the road configuration is straightforward, the DMRB screening method has been used to predict changes in air quality. Where the road layout is considered to be complex or where the use of the DMRB screening method indicated that there will be a potential exceedance of air quality standards, the atmospheric dispersion model ADMS-Roads has been used for the assessment. Professional judgment has been used to select the appropriate tool for each area.
- 5.1.3 In this study area both the DMRB screening method and the ADMS-Roads model have been used for the assessment.
- 5.1.4 An assessment of nutrient nitrogen and NO<sub>x</sub> concentrations was also undertaken at the Chilterns Beechwoods SAC because of its close proximity to the A4010 Aylesbury Road/Risborough Road, where changes in traffic during construction were found to meet DMRB criteria for further assessment. Values for the critical level and critical load, and baseline nitrogen deposition rates for the main habitats within the SAC were taken from the Air Pollution Information System website<sup>20</sup>.
- 5.1.5 Predicted NO<sub>x</sub> concentrations as a result of vehicle emissions were used to quantify nutrient nitrogen deposition in terms of in kilograms of nitrogen per hectare per year (kg N/ha/year). N deposition can lead to soil eutrophication and effects on ecosystem biodiversity.
- 5.1.6 The Chilterns Beechwoods SAC has two main types of habitat: the Asperulo-Fagetum beech forests and the semi-natural dry grassland and scrubland facies. The former of these two features is more sensitive to nutrient nitrogen and acid deposition with an empirical critical load of 10-20 kg N/ha/year and an average baseline nitrogen deposition rate of 50.7 kg N/ha/year in 2011. It can be observed that existing nitrogen deposition is already exceeding the upper end of the critical load range.
- 5.1.7 Future deposition rates for these habitats were calculated following the DMRB methodology. The predicted nitrogen deposition rate and NO<sub>x</sub> concentrations were calculated for the future construction year (2017) with and without the Proposed Scheme. The predicted contribution of the traffic to nitrogen deposition rate was compared to 1% of the critical load, as a test of insignificance. The total deposition

<sup>19</sup> Highways Agency, (2007), *The Design Manual for Roads and Bridges (Volume 11, Section 3, Part 1 Air Quality HA207/07)*

<sup>20</sup> Air Pollution Information System; Site relevant critical loads and source attribution; <http://www.apis.ac.uk/src/>; accessed August 2013.



rate (made of the additional contribution and the background) was also compared to 70% of the critical load, as an additional assessment criterion. This approach follows that used by the Environment Agency and Natural England when assessing the impacts of installations under the Environmental Permitting Regulations<sup>21</sup>.

- 5.1.8 Where the DMRB assessment did not rule out significant effects, nitrogen deposition rates and NO<sub>x</sub> concentrations were calculated with ADMS-Roads.

## 5.2 Model inputs and verification

### Model parameters for detailed assessment

- 5.2.1 ADMS-Roads was used for the detailed assessment. A surface roughness length of 0.25m, meteorological site surface roughness length of 0.2m, minimum Monin Obukhov length of 30m and latitude of 52 degrees were used in the detailed assessment. All other parameters were model default settings. Meteorological data from the London Heathrow monitoring site was used.

### Model verification

- 5.2.2 The traffic data provided for Aylesbury did not adequately cover roads close to monitoring locations that would allow meaningful verification to be undertaken. Therefore the model was not verified.

## 5.3 Construction traffic model

- 5.3.1 Roads assessed for construction traffic are detailed in Volume 5: Appendix TR-001-000. Scenarios assessed were based on maximum traffic on affected roads during the construction phase of the Proposed Scheme.

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<sup>21</sup> *The Environmental Permitting (England and Wales) Regulations 2010* (SI 2010 No. 675). London, Her Majesty's Stationery Office

## Receptors assessed

- 5.3.2 For all road links where DMRB criteria for assessing local air quality were met due to increased traffic flows, a number of receptors representative of worst-case exposure locations were selected for assessment. These included locations representative of highest pollutant concentrations along the roads, including closest to junctions or to the road itself.
- 5.3.3 All receptors where DMRB screening identified a likely moderate adverse or substantial adverse impact were also modelled within ADMS-Roads. Additional receptors close to DMRB receptors were added in order to ensure that worst-case exposure locations were captured.
- 5.3.4 Receptors assessed are presented in Table 6 and in Map AQ-01-011 (Volume 5, Air Quality Map Book). The majority of receptors assessed are situated on the A418 Oxford Road and the A41 Bicester Road, due to increases in construction traffic through Aylesbury.

Table 6: Modelled receptors (construction phase)

Receptor	Description/location	Ordnance Survey coordinates
11-1	Park Lodge, Oxford Road	479964, 212350
11-2	78 Oxford Road	481409, 213814
11-3	Billingsfield Cottages, Bicester Road	479150, 215427
11-4	38 Monmouth Close	480613, 214613
11-5	28 Pearson Close	480684, 212951
11-6	43 Pearson Close	480684, 212969
11-7	65 Rowland Way	480777, 213115
11-8	10 Bearbrook Close	481082, 213401
11-9	61 Friarscroft Way	481311, 213698
11-10	102 Oxford Road	481339, 213753
11-11	64 Oxford Road	481454, 213850
11-12	97 Friarage Road	481478, 213854
11-13	63 Oxford Road	481435, 213897
11-14	Morlands House, Friarage Road	481512, 213868
11-15	2 Gatehouse Road	481437, 213933
11-16	15 Gatehouse Road	481371, 213933
11-17	26 Gatehouse Road	481348, 213990
11-18	Avondale Care Home, Gatehouse Road	481298, 214029
11-19	161 Bicester Road	481096, 214460
11-20	173 Bicester Road	480995, 214498

Receptor	Description/location	Ordnance Survey coordinates
11-21	217 Bicester Road	480862, 214537
11-22	227 Bicester Road	480827, 214548
11-23	36 Monmouth Close	480452, 214673
11-24	22 Monmouth Close	480422, 214676
11-25	20 Monmouth Close	480379, 214691
11-26	24 Alderson Close	480118, 214760
11-27	Bicester Road (A41), Near Bronte Close	479901, 214860
11-28	26 Thackeray End	479937, 214829
11-29	39 Haines Close	479868, 214918
11-30	49 Galsworthy Place	479786, 214943
11-31	50 Galsworthy Place	479763, 214968
11-32	2 Gainsborough Place	479728, 215001
11-33	Chilterns Beechwoods SAC (A4010 Aylesbury Road/Risborough Road)	482615, 206049
11-34	Gaydon (A4010 Risborough Road (south of bypass))	483649, 208796

## Background concentrations

- 5.3.5 The background concentrations used in the assessment are shown in Table 7 taken from the Defra maps. For the ADMS-Roads dispersion modelling the use of background data from Defra maps and urban background sites was considered, but this approach was considered to underestimate baseline conditions to an extent that would unreasonably influence conclusions on the significance of air quality effects. The 2012 baseline was, therefore, derived from the average of concentrations monitored at three roadside sites on the A418 and A41, from which the contribution from the 2012 base traffic on the A41 and A418 was subtracted to derive the 2012 baseline background concentration for the locality. For 2017, the 2012 derived baseline was adjusted by a factor of 0.83, the same factor for the area as in the Defra background maps between 2012 and 2017. This approach was used in the study to reflect more accurately the existing concentrations in the AQMA that are present at the junction of the A418 and A41. This approach for background concentrations was considered to be the most representative.

Table 7: Background 2017 concentrations at assessed receptors

Receptor (or zone of receptors)	Concentrations ( $\mu\text{g}/\text{m}^3$ )		
	NO <sub>x</sub>	NO <sub>2</sub>	PM <sub>10</sub>
11-1 Park Lodge	14.1	9.9	14.6
11-2 78 Oxford Road	Not recorded	28.0	15.9
11-3 2 Billingsfield Cottages	14.4	10.1	15.3

Receptor (or zone of receptors)	Concentrations ( $\mu\text{g}/\text{m}^3$ )		
	NO <sub>x</sub>	NO <sub>2</sub>	PM <sub>10</sub>
11-4 Property on Monmouth Close	Not recorded	28.0	16.0
11-5 to 11-32 Properties on or adjoining A418 and A41	Not recorded	28.0	N/A
11-33 Chilterns Beechwoods SAC	13.8	N/A	N/A
11-34 Gaydon	13.2	9.2	14.8

## Design Manual for Roads and Bridges model results

- 5.3.6 This section provides the summary of the modelled pollutant concentrations for the assessed receptors using the DMRB methodology. The magnitude of change and impact descriptor are also derived following the Environmental Protection UK (EPUK) methodology<sup>22</sup>. The criteria used to define significance at the ecological sites identified is in line with guidance set out in the Environment Agency H1 guidance document<sup>23</sup>, which in turn refers back to joint Environment Agency/Natural England guidance.

Table 8: Summary of DMRB annual mean NO<sub>2</sub> results (construction phase)

Receptor	Concentrations (µg/m <sup>3</sup> )			Change in concentrations (µg/m <sup>3</sup> )	Magnitude of change	Impact descriptor
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme			
11-1	19.7	16.7	18.5	1.7	Small increase	Negligible
11-2	40.0	33.5	34.9	1.4	Small increase	Negligible
11-3	21.4	17.8	21.2	3.4	Medium increase	Negligible
11-4	44.1	36.7	40.5	3.8	Medium increase	Moderate adverse
11-34	14.4	12.8	12.9	0.1	Imperceptible increase	Negligible

Table 9: Summary of DMRB annual mean PM<sub>10</sub> results (construction phase)

Receptor	Concentrations (µg/m <sup>3</sup> )			Change in concentrations (µg/m <sup>3</sup> )	Magnitude of change	Impact descriptor
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme			
11-1	16.8	15.9	16.0	0.2	Imperceptible increase	Negligible
11-2	18.1	17.0	17.2	0.1	Imperceptible increase	Negligible
11-3	17.5	16.4	16.8	0.3	Imperceptible increase	Negligible

<sup>22</sup> Environmental Protection UK (EPUK), (2010), *Development Control: Planning for Air Quality*

<sup>23</sup> Environment Agency, (2011), *H1 Annex F - Air Emissions v2.2*

Receptor	Concentrations ( $\mu\text{g}/\text{m}^3$ )			Change in concentrations ( $\mu\text{g}/\text{m}^3$ )	Magnitude of change	Impact descriptor
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme			
11-4	18.8	17.4	17.8	0.4	Small increase	Negligible
11-34	16.2	15.5	15.5	<0.1	Imperceptible increase	Negligible

Table 10: Critical level assessment for the protection of vegetation

Receptor	NOx concentrations ( $\mu\text{g}/\text{m}^3$ )							
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme	Change in concentrations ( $\mu\text{g}/\text{m}^3$ )	Critical level (annual mean)	Change in concentrations as % of critical level	Total NOx as a % of critical level	Potentially significant? <sup>24</sup>
11-33	25.2	22.3	24.2	2.0	30	6.6	80.8	Yes

Table 11: Critical load - nutrient nitrogen deposition

Receptor	Nitrogen deposition rate (kg N/ha/year)							
	2012 baseline deposition	2017 without Proposed Scheme	2017 with Proposed Scheme	Change in deposition (kg N/ha/year)	Critical load range (kg N/ha/year)	Change in deposition as % of critical load	Total nitrogen deposition as a % of critical load	Potentially significant? <sup>25</sup>
11-33	50.7	53.1	53.7	0.6	10-20	5.7 (low) 2.8 (high)	537 (low) 268 (high)	Yes

<sup>24</sup> Change in NOx concentration greater than 1% of critical level and total NOx concentration greater than 70% of critical level.<sup>25</sup> Change in N deposition greater than 1% of critical load and total N deposition greater than 70% of critical load.

## Detailed modelling results

5.3.7 This section provides the summary of the modelled pollutant concentrations for the assessed receptors using ADMS-Roads. The magnitude of change and impact descriptor for human receptors are derived following the EPUK methodology<sup>22</sup>. The criteria used to define significance at the ecological sites identified are in line with guidance set out in the Environment Agency H1 guidance document<sup>26</sup>, which in turn refers back to joint Environment Agency/Natural England guidance. With regard to ecology, in order to indicate the area of the habitat that may be subject to significant effects, the model included transects at increasing distances away from the roadside.

Table 12: Summary of ADMS-Roads annual mean NO<sub>2</sub> results (construction phase)

Receptor	Concentrations (µg/m <sup>3</sup> )			Change in concentrations (µg/m <sup>3</sup> )	Magnitude of change	Impact descriptor
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme			
11-2	39.0	33.5	35.5	2.0	Medium increase	Slight adverse
11-4	39.7	33.2	35.1	1.9	Small increase	Negligible
11-5	36.3	31.6	33.2	1.6	Small increase	Negligible
11-6	36.1	31.4	32.9	1.5	Small increase	Negligible
11-7	35.8	31.1	32.3	1.1	Small increase	Negligible
11-8	34.7	30.3	31.1	0.8	Small increase	Negligible
11-9	35.9	31.2	32.3	1.1	Small increase	Negligible
11-10	38.7	33.2	35.0	1.8	Small increase	Negligible
11-11	39.3	33.7	35.9	2.2	Medium increase	Slight adverse
11-12	36.2	31.4	32.7	1.3	Small increase	Negligible
11-13	40.5	34.2	36.6	2.4	Medium increase	Moderate adverse
11-14	34.1	29.8	30.5	0.7	Small increase	Negligible
11-15	40.2	34.0	36.4	2.4	Medium increase	Moderate adverse
11-16	36.9	31.5	32.7	1.2	Small increase	Negligible
11-17	37.5	31.8	33.2	1.4	Small increase	Negligible
11-18	36.4	31.1	32.2	1.1	Small increase	Negligible
11-19	33.4	29.2	29.6	0.4	Small increase	Negligible
11-20	36.9	31.5	32.8	1.3	Small increase	Negligible
11-21	38.7	32.7	34.5	1.8	Small increase	Negligible

<sup>26</sup> Environment Agency, (2011), *H1 Annex F - Air Emissions v2.2*

Receptor	Concentrations ( $\mu\text{g}/\text{m}^3$ )			Change in concentrations ( $\mu\text{g}/\text{m}^3$ )	Magnitude of change	Impact descriptor
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme			
11-22	39.6	33.4	35.5	2.1	Medium increase	Slight adverse
22-23	40.0	33.9	36.3	2.4	Medium increase	Moderate adverse
11-24	42.4	35.4	38.4	2.9	Medium increase	Moderate adverse
11-25	42.2	35.2	38.0	2.8	Medium increase	Moderate adverse
11-26	40.8	34.2	36.5	2.3	Medium increase	Moderate adverse
11-27	41.9	35.1	37.7	2.6	Medium increase	Moderate adverse
11-28	38.6	32.8	34.7	1.8	Small increase	Negligible
11-29	40.9	34.3	36.9	2.5	Medium increase	Moderate adverse
11-30	37.3	31.9	33.4	1.5	Small increase	Negligible
11-31	37.1	31.7	32.9	1.3	Small increase	Negligible
11-32	37.1	31.6	33.0	1.5	Small increase	Negligible

Table 13: Critical level assessment for the protection of vegetation

Receptor	NOx concentrations ( $\mu\text{g}/\text{m}^3$ )							Potentially significant? <sup>11</sup>
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme	Change in concentrations ( $\mu\text{g}/\text{m}^3$ )	Critical level ( $\mu\text{g}/\text{m}^3$ ) (annual mean)	Change in concentrations as % of critical level	Total NOx as a % of critical level	
11-33 (10m)	26.3	21.5	22.4	0.9	30	2.9	74.6	Yes
11-33 (20m)	22.7	18.6	19.1	0.5	30	1.8	63.8	No
11-33 (50m)	19.6	16.0	16.3	0.3	30	0.9	54.4	No
11-33 (100m)	18.2	15.0	15.1	0.1	30	0.5	50.4	No
11-33 (150m)	17.7	14.5	14.6	0.1	30	0.3	48.8	No
11-33 (200m)	17.4	14.3	14.4	0.1	30	0.3	47.9	No



Table 14 Critical load - nutrient nitrogen deposition

Receptor	Nitrogen deposition rate (kg N/ha/year)							
	2012 baseline deposition	2017 without Proposed Scheme	2017 with Proposed Scheme	Change in deposition (kg N/ha/year)	Critical load range (kg N/ha/year)	Change in deposition as % of critical load	Total nitrogen deposition as a % of critical load	Potentially significant? <sup>12</sup>
11-33 (10m)	50.7	51.8	51.9	0.1	10-20	1.2 (low) 0.6 (high)	519 (low) 260 (high)	Yes
11-33 (20m)	50.7	51.4	51.5	0.1	10-20	0.8 (low) 0.4 (high)	515 (low) 257 (high)	No
11-33 (50m)	50.7	51.0	51.1	<0.1	10-20	0.4 (low) 0.2 (high)	511 (low) 255 (high)	No
11-33 (100m)	50.7	50.9	50.9	<0.1	10-20	0.2 (low) 0.1 (high)	509 (low) 254 (high)	No
11-33 (150m)	50.7	50.8	50.8	<0.1	10-20	0.1 (low) 0.1 (high)	508 (low) 254 (high)	No
11-33 (200m)	50.7	50.8	50.8	<0.1	10-20	0.1 (low) <0.1 (high)	508 (low) 254 (high)	No

## Assessment of significance

- 5.3.8 Using the DMRB methodology, the overall magnitude of impacts of the Proposed Scheme at the most exposed receptors was found to be moderate adverse at worst for NO<sub>2</sub> and negligible for PM<sub>10</sub> during the construction phase.
- 5.3.9 Following a further more detailed assessment using ADMS-Roads, the overall magnitude of impact of the Proposed Scheme was found to be moderate adverse for NO<sub>2</sub> at a number of receptors along the A41 in Aylesbury and slight adverse or negligible at other locations. Pollutant concentrations are predicted to remain within air quality standards during construction with and without the Proposed Scheme. These receptors are close to the Friarage AQMA.
- 5.3.10 The moderate adverse impacts will be a significant effect for those receptors along parts of the A41 and limited in temporal extent.
- 5.3.11 With regard to the sensitive ecological habitats, a potentially significant effect was predicted at the Chilterns Beechwoods SAC, adjacent to the A4010 Aylesbury Road/Risborough Road, for total NO<sub>x</sub> concentrations and nutrient nitrogen deposition following a DMRB assessment.

- 5.3.12 Following a more detailed assessment using ADMS-Roads, it was found that changes to air quality will have a potentially significant effect for total NO<sub>x</sub> and nutrient nitrogen deposition on those parts of the SAC within 20m of the road, taking into account background concentrations of NO<sub>x</sub>. This small increase will be temporary, of very limited spatial extent and will not be a significant effect on the integrity of the SAC.

## 5.4 Operational traffic model

- 5.4.1 Operational traffic data on which this assessment is based are detailed in Volume 5: Appendix TR-001-000. Scenarios assessed were based on maximum traffic on affected roads during the operational phase of the Proposed Scheme.

### Receptors assessed

- 5.4.2 For all road links where DMRB criteria for assessment of local air quality impacts were met, a number of receptors representative of worst-case exposure locations were selected for assessment. These included locations representative of highest pollutant concentrations along the roads, including closest to junctions or to the road itself. All roads within the study area were identified and assessed as a result of road-realignment away from receptors. Receptors assessed are presented in Map AQ-01-011 (Volume 5, Air Quality Map Book).

Table 15: Modelled receptors (operational phase)

Receptor	Description/Location	Ordnance Survey coordinates
11-35	The Oaks/Hartwell Cottages (A418 Oxford Road)	480283, 212484
11-36	Hatters End (new bypass (south of Marsh Lane))	483404, 209519
11-37	Hall End/property on B4443 (new bypass (north of Marsh Lane))	482534, 210845

## Background concentrations

- 5.4.3 The background concentrations used in the assessment are shown in Table 16 taken from the Defra maps.

Table 16: Background 2026 concentrations at assessed receptors

Receptor (or zone of receptors)	Concentrations (µg/m <sup>3</sup> )		
	NO <sub>x</sub>	NO <sub>2</sub>	PM <sub>10</sub>
11-35 The Oaks/Hartwell Cottages	12.8	8.9	14.3
11-36 Hatters End	10.8	7.7	14.1
11-37 Hall End/property on B4443	11.0	7.8	14.2

## Design Manual for Roads and Bridges model results

5.4.4 This section provides the summary of the modelled pollutant concentrations for the assessed receptors using the DMRB methodology. The magnitude of change and impact descriptor are also derived following the EPUK methodology<sup>22</sup>.

Table 17: Summary of DMRB annual mean NO<sub>2</sub> results (operational phase)

Receptor	Concentrations (µg/m <sup>3</sup> )		Change in concentrations (µg/m <sup>3</sup> )	Magnitude of change	Impact descriptor
	2026 without Proposed Scheme	2026 with Proposed Scheme			
11-35	14.9	10.7	-4.2	Large decrease	Slight beneficial
11-36	7.7	7.8	0.2	Imperceptible increase	Negligible
11-37	7.8	8.7	0.9	Small increase	Negligible

Table 18: Summary of DMRB annual mean PM<sub>10</sub> results (operational phase)

Receptor	Concentrations (µg/m <sup>3</sup> )		Change in concentrations (µg/m <sup>3</sup> )	Magnitude of change	Impact descriptor
	2026 without Proposed Scheme	2026 with Proposed Scheme			
11-35	15.5	14.6	-0.9	Imperceptible decrease	Negligible
11-36	14.1	14.2	<0.1	Imperceptible increase	Negligible
11-37	14.2	14.4	0.2	Imperceptible increase	Negligible

### Assessment of significance

- 5.4.5 The overall magnitude of impact is slight beneficial for NO<sub>2</sub> and negligible for PM<sub>10</sub> during the operation of the Proposed Scheme. The beneficial impacts are due to road realignments moving traffic further from receptors. Pollutant concentrations will remain well within air quality standards with and without the Proposed Scheme. AQMAs lie outside the study area.
- 5.4.6 The changes in air quality at worst-case receptors during the construction phase will not cause significant effects since the adverse impact is negligible, taking into account background air quality and air quality standards.

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